University of Oxford Department of Computer Science

# Job description and selection criteria

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| **Job title** | Research Software Engineer |
| **Division** | MPLS |
| **Department** | Computer Science |
| **Location** | Wolfson Building, Parks Road, Oxford, OX1 3QD |
| **Grade and salary** | Grade 7: starting salary £30,434 - £37,394 (with a discretionary range to £40,847) |
| **Hours** | Full-time |
| **Contract type** | Fixed term contract for 9 months |
| **Reporting to** | Professor David Gavaghan and Dr Joe Pitt-Francis |
| **Additional information** | Please note that the appointment of the successful candidate will be subject to standard compulsory pre-employment screening, such as right-to-work checks |
| **Vacancy reference** | 114751 |

## Introduction

### The University

The University of Oxford is a complex and stimulating organisation, which enjoys an international reputation as a world-class centre of excellence in research and teaching. It employs over 10,000 staff and has a student population of over 22,000.

Most staff are directly appointed and managed by one of the University's 130 departments or other units within a highly devolved operational structure - this includes over 6,500 'academic-related' staff (postgraduate research, computing, senior library, and administrative staff) and over 2,700 'support' staff (including clerical, library, technical, and manual staff). There are also over 1,600 academic staff (professors, readers, lecturers), whose appointments are in the main overseen by a combination of broader divisional and local faculty board/departmental structures. Academics are generally all also employed by one of the 38 constituent colleges of the University as well as by the central University itself.

Our annual income in 2011/12 was £1,016.1m. Oxford is one of Europe's most innovative and entrepreneurial universities: income from external research contracts exceeds £409m p.a., and more than 80 spin-off companies have been created.

For more information please visit www.ox.ac.uk/staff/about_the_university.html

## MPLS Division

The Mathematical, Physical, and Life Sciences Division (MPLS) is one of the four academic divisions of the University.

Oxford is widely recognised as one of the world's leading science universities. In the 2008 UK Research Assessment Exercise over 70% of research activity in MPLS was judged to be world-leading (4*) or internationally excellent (3*), and Oxford was ranked first in the UK across the mathematical sciences as a whole.

The MPLS division's ten departments and three interdisciplinary units span the full spectrum of the mathematical, computational, physical, engineering and life sciences, and undertake both fundamental research and cutting-edge applied work. We have over 6,000 students and research staff, and generate over half of our funding from external research grants. Our research addresses major societal and technological challenges and is increasingly interdisciplinary in nature. We collaborate closely with colleagues in Oxford across the medical sciences, social sciences and humanities, as well as with researchers from around the world.

For more information, please visit:

http://www.mpls.ox.ac.uk/

### Department of Computer Science

The Department of Computer Science (DoCS) was established in 1957. It is one of the UK's leading Computer Science Departments (ranked first in a number of newspaper rankings, and third in terms of research power). In the RAE in 2008, 80% of the submitted research was found to be in the top two tiers, either 4* (world-leading) or 3* (internationally excellent). Many members of the Department are active in externally sponsored research, with both government and industrial funding. At present there are 52 members of academic staff and over 80 research staff.

DoCS has close links with government, industry, and other departments within the University. Among the latter are Mathematics, Engineering, Physics, Statistics and a number of life sciences departments. It has a major role in the rapidly-developing field of e-Science alongside the Oxford e-Research Centre, an independent unit with which we share a building. This is an essentially inter-disciplinary activity which is at present attracting major funding from a number of sources. At present DoCS holds £37m in external research contracts.

Research in DoCS is currently managed in seven themes. Software Engineering (led by Professor Jim Davies), works on a wide variety of areas including e-Science and model-driven development; Programming Languages (led by Professor Jeremy Gibbons and including Dr Ralf Hinze and Professor Oege de Moor); Security (leader Professor Bill Roscoe, with Professor Sadie Creese leading a new Cyber Security Centre, and Professor Gavin Lowe); Verification (leader Professor Marta Kwiatkowska) covering probabilistic and software model checking (Professor Daniel Kroening) with time and concurrency (Professor Joel Ouaknine, Professor James Worrell, and Professors Roscoe and Lowe), and automated verification of hardware (Professor Tom Melham); Computational Biology (led by Professor David Gavaghan and including Professors Kevin Burrage and Helen Byrne) is one of the

world's leading groups building computational models of biological systems and is particularly well known for its work on the heart; and Foundations, Logic and Structures, (leader, Professor Samson Abramsky) which includes groups working on quantum information and computation (Abramsky and Professor Bob Coecke), game semantics and verification (Professor Luke Ong) and constraints (Professor Peter Jeavons); Information Systems (jointly led by Professors Georg Gottlob and Ian Horrocks and including Professor Stephen Pulman, who works on Computational Linguistics, and Professor Michael Benedikt). In addition the department has recently recruited Professors Mike Wooldridge (Agent Based Systems) and Elias Koutsoupias (Algorithms). A realignment of the themes is expected shortly.

For more information please visit: **http://www.cs.ox.ac.uk/**

## Job description

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| **Research topic** | Computational Biology |
| **Principal Investigator / supervisor** | Professor David Gavaghan |
| **Funding partner** | EPSRC and Microsoft Research Cambridge |

## Overview of the role

The University of Oxford, University College London and Microsoft Research, Cambridge have received funding from the EPSRC Cross-Disciplinary Interfaces Programme (C-DIP) for a programme of research that will involve up to 17 post-doctoral fellowships over a five year period. The 2020 Science programme is focused on fostering the creation of a new generation of future scientific leaders – new kinds of scientists with the ability to lead the way in tackling fundamental challenges in science in areas of societal importance. At the heart of the programme is the development and application of computational tools and novel approaches to the scientific computing, scientific software development and software engineering that underpin the development of predictive models of complex, multi-scale natural systems. One of the core pieces of software used within the 2020 Science programme is Chaste.

Chaste (**C**ancer, **H**eart **a**nd **S**oft **T**issue **E**nvironment) is a multiscale, multiphysics simulation framework consisting of object oriented C++ libraries (www.cs.ox.ac.uk/chaste). Chaste is being developed by a team mainly based in the Computational Biology Group at the University of Oxford's Department of Computer Science. Chaste is unusual among academic codes due to being developed with test-driven agile methodologies and released as open source. These factors have contributed to it being downloaded over 1000 times from 400 unique locations, and it is being used by research groups around the world, both academic and industrial, including the FDA and NASA. Although Chaste is a general computational and numerical modelling framework there are two main strands of development: simulations of electro-mechanical activation in the heart; and multiscale simulations of interacting populations of cells with specific application to tissue homeostasis and carcinogenesis.

Further information on the 2020 Science programme and its scientific remit can be found at www.2020science.net

## The position

One of the main obstacles to wider uptake of Chaste with users, both academic and industrial, is the difficulty of getting started. With many and varied dependencies, the installation process can be challenging and require a fair amount of systems administration understanding. The technical infrastructure managing the project also makes it difficult for external users/developers to contribute back. This role will work to remove these barriers to adoption.

## Responsibilities/duties

The postholder will carry out development work as a member of the University of Oxford, based in the Department of Computer Science, and as such be responsible to the Principal Investigators of the 2020 Science Programme. The successful candidate will also interact with our collaborative partners when necessary, including Research Fellowship holders at University College London and Microsoft Research Cambridge.

Responsibilities:

1. Switching the Chaste development infrastructure from Subversion to Git
2. Upgrading or replacing the Chaste continuous integration framework
3. Improving cross-platform support within Chaste
    a. Ease of installation and use, including documentation
    b. Performance on Windows

Crucially, with all tasks the steps taken to complete them must be documented, along with a record of failed approaches. The Chaste development team must also be familiarised with using the results.

Activities:

1. Move to using Git for the main Chaste repository (internally and externally hosted)
2. Upgrade Chaste Trac system to work with this
3. Investigate and implement the most appropriate solution for Chaste continuous integration (currently this is a home-grown system written in Python and Bash, and tightly integrated with the SCons build process)
4. Update the Chaste installation process on Mac OS X to ensure compatibility with recent releases, and improve automation and documentation
5. Improve the Chaste installation process on Windows
    a. Support for Windows 7 and 8
    b. Support for Visual Studio 2010, 2012 and 2013
6. Improve Chaste performance on Windows, using optimised compilation of Chaste and third-party packages
7. Update support for third-party libraries to their latest versions as required
8. Depending on time available and skills, contribute to the general development of Chaste particularly to increase its usability for researchers
9. Participate in regular meetings with colleagues at University College London, the University of Oxford and Microsoft Research, to include the reporting of results from the work being conducted at Oxford
10. Carry out any other duties as are within the scope, spirit and purpose of the job as requested by their line manager or the Principal Investigators

## Selection Criteria

### Essential:

1. Experience of cross-platform C++ programming
2. Experience of the Git version control system
3. Experience of continuous integration environments
4. Experience of Windows development environments/tools, i.e. Visual Studio
5. Experience of cross-platform C++ build frameworks, e.g. CMake, SCons
6. Good written and oral communication skills in English
7. Proven ability to work effectively in a team and individually

### Desirable:

1. Experience of any of the following:
   - Python programming
   - The Subversion version control system
   - The SCons build system
   - Setting up Jenkins and BuildBot
   - Trac project management system
   - Linux systems administration
2. Experience of scoping and/or appraising new or alternative technologies
3. Experience of packaging and deployment
4. Experience of scientific computing, including PETSc
5. An undergraduate degree in software engineering or a related discipline
6. Experience of multidisciplinary research settings

## Working at the University of Oxford

For further information about working at Oxford, please see:

http://www.ox.ac.uk/about_the_university/jobs/research/

### Salary and Benefits

The post, which is a fixed term appointment for up to 9 months, has a salary on the University grade 07S scale (currently £30,434 to £37,394, with a discretionary range to £40,847), includes membership of the University Superannuation Scheme (USS) and has an annual leave entitlement of 38 days per year (inclusive of all public holidays and university closed periods). Requests for appointment on a part time or flexible basis will be considered.

The University is a family friendly employer and offers a number of benefits detailed at http://www.admin.ox.ac.uk/personnel/staffinfo/benefits/family/

## How to apply

If you consider that you meet the selection criteria, click on the **Apply Now** button on the 'Job Details' page and follow the on-screen instructions to register as a user. You will then be required to complete a number of screens with your application details, relating to your skills and experience. When prompted, please provide details of two referees and indicate whether we can contact them at this stage.

You will also be required to upload:

1. A full curriculum vitae;
2. A letter, referred to as the supporting statement, explaining how you meet the requirements of the post.

*****Please note two references must also be received by the closing date.*****

The supporting statement should describe how you meet the selection criteria outlined above. This may have been employment, education, or you may have taken time away from these activities in order to raise a family, care for a dependant, or travel for example. Your application will be judged solely on the basis of how you demonstrate that that you meet the selection criteria outlined above and we are happy to consider evidence of transferable skills or experience which you may have gained outside the context of paid employment or education.

Please save all uploaded documents to show your name and the document type.

All applications must be received by **midday** on the closing date stated in the online advertisement.

Candidates must also ask their referees to consider this job description and email their reference directly to **job14@cs.ox.ac.uk** or, alternatively, post or fax it to: The Administrator, Department of Computer Science, Wolfson Building, Parks Road, Oxford OX1 3QD, such that the reference arrives by, or shortly after, the advertised closing date. You will also be asked to provide reference details as part of the online application process and will be asked to indicate whether you are happy for us to contact your referees directly should they not provide a reference by the stated closing date.
Should you experience any difficulties using the online application system, please email recruitment.support@admin.ox.ac.uk

To return to the online application at any stage, please click on the following link www.recruit.ox.ac.uk

Please note that you will be notified of the progress of your application by automatic e-mails from our e-recruitment system. **Please check your spam/junk mail** regularly to ensure that you receive all e-mails.

Potential candidates are welcome to contact Jonathan Cooper (jonathan.cooper@cs.ox.ac.uk) or Joe Pitt-Francis (joe.pitt-francis@cs.ox.ac.uk) to discuss the role informally before making a formal application.